Gelatine: Making Coworking Places Gel for Better Collaboration and Social Learning

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ABSTRACT
Public libraries and coworking spaces seek for means to facilitate peer collaboration, peer inspiration and cross-pollination of skills and creativity. However, social learning, inspiration and collaboration between coworkers do not come naturally. In particular in (semi-) public spaces, the behavioural norm among unacquainted coworkers is to work in individual silos without taking advantage of social learning or collaboration opportunities. This paper presents results from a pilot study of 'Gelatine' – a system that facilitates shared encounters between coworkers by allowing them to digitally 'check in' at a work space. Gelatine displays skills, areas of interest, and needs of currently present coworkers on a public screen. The results indicate that the system amplifies users' sense of place and awareness of other coworkers, and serves as an interface for social learning through exploratory, opportunistic and serendipitous inspirations, as well as through helping users identify like-minded peers for follow-up face-to-face encounters. We discuss how Gelatine is perceived by users with different pre-entry motivations, and discuss users' challenges as well as non-use of the system.

Author Keywords
Urban Informatics; Ambient Displays; Public Screens; Social Computing; Social Learning; Collaborative Learning; Collaboration Spaces; Smart Spaces; Learning Environments

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
The knowledge economy of the 21st century requires skills such as creativity, critical thinking, problem solving, communication and collaboration (Partnership for 21st century skills, 2011) – skills that cannot easily be learnt from books, but rather through learning-by-doing and social interaction. Big ideas and disruptive innovation often result from collaboration between individuals from diverse backgrounds and areas of expertise. Public libraries, organisations and coworking spaces have been continuously seeking for means to facilitate social encounters and peer collaboration to nurture cross-pollination of skills, creativity and innovation. The more diverse the people that an institution hosts, the more potential there is for social and collaborative learning – however, the social atmosphere appears to be more public and less familial.

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This controversy is illustrated by the social space and user interactions usually found in public libraries. The library is one of the few remaining "truly" public places (Leckie & Hopkins, 2002) that is frequented by people from a broad cross-section of society with a high diversity of socio-cultural backgrounds and areas of expertise. As such it has a high potential for mutual inspiration and cross-pollination of skills, knowledge and experiences among library users.

However, the library also appears to be perceived as a typical "third place" (Oldenburg, 2001) in the public realm where users usually regard each other as strangers. People mostly work within their "individual bubbles" (Aabo & Audunson, 2012, p.143), many even weaving "an individual net around themselves that does not invite communication with others" (2012, p.143), for example, by marking their work space with coats, bags, notebooks, and other possessions (McKechnie et al., 2004, p.44). In general, library users perform their individual activities next to each other, without taking advantage of the social capital and knowledge networks within the community of other users. Whilst isolated work should not be discouraged – in fact, the library as a place for individual study and rejuvenation is highly appreciated by users and needs to be preserved as such (Waxman, Clemons, Banning, & McKelfresh, 2007) – there is untapped potential for serendipitous social learning, inspirations and the creation of social capital (Aabo & Audunson, 2012; Aabo, Audunson, & Varheim, 2010). Especially in today's new economy with an increasing amount of independent, self-employed, and project based workers, the role of public libraries, as socially inclusive spaces for coworking, is more important than ever before. How can public libraries cater for the social needs of coworkers (Deskmag, 2011), such as opportunities through social interactions and ability to share knowledge with other coworkers?

This paper contributes new insights and knowledge to the question how digital technology can support the design of collaborative interactive spaces. We present the design and evaluation of 'Gelatine,' an ambient media system we developed in the context of a case study at The Edge – a

dedicated space for social and collaborative learning at the State Library of Queensland. Gelatine is a real-time user checkin-system that makes visible the invisible social aspects of the library as a 'place,' in particular, by displaying currently physically present users' backgrounds, skills, and interests, on a public screen inside The Edge.

THEORETICAL FRAMEWORK: SPACE, PLACE, AND SENSE OF PLACE

Scholars distinguish between the concepts of *space* and *place* (Dourish, 2006; Harrison & Dourish, 1996; Tuan, 1977). While the term 'space' primarily refers to geometrical and physical configurations of infrastructure, 'place' covers a broader concept embracing a social layer of meanings that people attach to a space. People attach social attributes such as meanings, memories and experiences through their everyday practices, activities and interactions with and in a space, thus render space into 'place.' The same location might have a different meaning to different people, depending on their subjective and emotional relationship to a place. Space is designed and built by architects and spatial designers, while place is a social construct – created by the way people make sense and use of it. Placemaking, then, as practiced for example by urban planners or architects, is an attempt to design spaces that accommodate and invite particular activities and spatial behaviours. However, as Harrison and Dourish point out, the question *if* and *how* a place is actually produced, is not in the hands of a designer, but subject to how users appropriate and make use of that space. "Placeness can be designed *for,* but it can't be designed *in […]* The best that the designers can do is to put the tools into their hands. Trying to do more – trying to build places – is not our job." De Certeau's concept of 'tactical practices' (Certeau & Rendall, 1984), Levebvre's (1991) distinction between *perceived*, *conceived* and *lived* space, and Soja's notion of *counterspaces* (1996, p.68) further describe the gulf between how designers often imagine a space being utilised and perceived, and how people actually interpret, make sense of and use space. The different interpretations and meanings that people attach to a place collectively shape a *sense of place* (Tuan, 1977), and shape the behavioural norm of people at this place.

What does this mean for the design of collaboration and learning spaces? Library designers, for example, put much effort into the physical design of lounge areas, meeting rooms, cafés and other 'open' spaces that invite social interaction, collaborative work, peer-to-peer learning, meetings and social hangouts (LaPointe, 2006; Ludwig & Starr, 2005; Shill & Tonner, 2003; Talve, 2011). However, in practice, there seems to remain a social barrier to peer interactions and focused encounters (Goffman, 1966) between most (unacquainted) library users. The behavioural norm is to work in isolation from other users (Aabo & Audunson, 2012; McKechnie et al., 2004). Physical infrastructure that accommodates and invites social learning is not sufficient to turn a social learning *space* into a *place* where social learning is actually being practiced and experienced.

We identified such a gulf between *designed* space and *lived* place in our previous fieldwork at The Edge (Bilandzic & Foth, 2013). The motivation to bridge this gulf marked the point of departure for this study. Can a public screen application that highlights particular social aspects and use patterns of a place, re-inforce and amplify a particular 'sense of place' that users would not be able to perceive otherwise? The following section discusses previous work on public screens, before we discuss the design rationale for Gelatine.

RELATED WORK: PUBLIC SCREENS AND SHARED ENCOUNTERS

Struppek (2006) provides a summary of projects demonstrating the 'social potential' of urban screens, i.e. screens that display cultural content and support the development of a local community around those screens. The common denominator of most such public screen applications is their aim to foster social behaviour between people with weak ties or no ties, in order to counteract the natural behavioural patterns of 'civil inattention' (Goffman, 1966) between unacquainted people. Previous studies have explored the impact of public screens in various settings, e.g., organisation and workplaces (Churchill, Nelson, Denoue, Helfman, & Murphy, 2004; McCarthy, Congleton, & Harper, 2008), third places (McCarthy et al., 2009) or urban outdoor places (Morrison, Jacucci, & Peltonen, 2008; Schroeter, Foth, & Satchell, 2012; Struppek, 2006). Results of those studies report that public screens can serve as an icebreaker for conversations (Churchill et al., 2004), increase awareness amongst colleagues (McCarthy et al., 2008) as well as social capital and participation among coworkers (DiMicco, Millen, Geyer, & Dugan, 2008; IBM Research, 2011). In contrast to other social networking systems that foster relationships between people with already existing strong ties (e.g. friends on Facebook), *situated* social software applications, such as *CoCollage* (McCarthy et al., 2009), help create links between co-located people in the same space, i.e. "*help people who are in the same physical context become friends, or at least become more familiar strangers"* (p.8).

Such links do not necessarily have to involve direct face-to-face interactions, but can be indirect, or what Goffman refers to as 'unfocused interactions' (Goffman, 1972). Willis et al. (2010) introduces 'shared encounters' as a term to describe interactions between people who share the same physical context, i.e. interactions "between two people or within a group where a sense of performative co-presence is experienced and which is characterised by a mutual recognition of spatial or social proximity" (p.4). 'Digital encounters' as defined by Fatah et al. (2010), then, are shared encounters that are mediated by digital technology, such as a mobile phone or public display. Fatah et al. show that digital encounters can create new forms of situated interactions that would not evolve without the use of technology. However, as Konomi et al. (2010) state, "digitally augmented settings may not effectively support encounters, unless it is integrated with human interaction processes and social conventions" (p.

54), Digital systems that are designed to facilitate shared encounters need to be sensitive to the socio-cultural peculiarities and function of the particular place of installation. So far, only little is known about the design and potential social impact of situated social software applications displayed on public screens in library environments. Previous work on interactive public screens in libraries focused on facilitating serendipitous discoveries by providing an alternative, digital access point to the library's book archives, e.g. visualising the circulation of checked out books (Legrady, 2005), or providing flexible, artistic, animated and playful interfaces (Groenbaek, Rohde, Sundararajah, & Bech-Petersen, 2006; Thudt, Hinrichs, & Carpendale, 2012) to explore library archives. Gelatine has a different focus; it does not facilitate connections between users and books, but rather connections among the user community. It aims to enhance and reinforce the vision of contemporary libraries as places for social learning, participation, interaction and collaboration. The following section describes the background and design rationale behind Gelatine.

GELATINE: SYSTEM DESIGN

The design of Gelatine follows the idea of Commons 2.0 (B. Sinclair, 2007). Whilst libraries have long been perceived as 'gatekeepers' for information and knowledge (with a clear distinction between the library as an information *provider* and the user as an information *consumer*), Commons 2.0 puts a strong emphasis on social constructivism (cf. Vygotsky, 1978), collaboration and co-creation of knowledge. Commons 2.0 recognises and promotes the library user themself as an asset and resource for information, inspiration and social learning to other, co-present users.

The design rationale behind Gelatine is based on extensive previous ethnographic field research at our case study site at The Edge (Bilandzic & Foth, 2013), and identification of five user personas with different pre-entry motivations, perceived barriers and needs. The results reveal a mismatch between the vision of the State Library of Queensland for The Edge as a place for social learning and collaboration, and users' actual pre-dominant patterns of isolated work and rare interactions with other coworkers. The design was specifically targeted at two issues: (1) We found that users lack a perceived affordance to identify other users as potential information resources. Whilst library catalogues, themed bookshelves and the labels on book covers provide easily perceivable affordances to search, browse and find printed information material, the physical environment of most libraries does not communicate much about their user community and the collective intelligence it has to offer. (2) As a consequence, users of The Edge, as a Commons 2.0 library space that went entirely bookless, are often puzzled about what the space is for and what one can do there to begin with – they lack a sense for The Edge being a place for social learning and collaboration. Instead, perceiving many other visitors working in isolated silos reinforces a sense of place that counteracts its intended purpose. As one user stated, *"when I go in there, I don't really talk to anyone that I don't know, just because they are kind of already doing stuff mostly individually, but I don't know… it feels like the wrong type of people are there."*

Aiming to bridge these two barriers, Gelatine was designed as a combination of a checkin-system and a real-time public screen installation that highlights the *skills*, *interests* and *help requests* of currently present users in the space (Figure 1). Rendering such invisible social resources visible, the two design goals were (1) to enhance people's perception of other users in the space as a source for incidental as well as goal-directed social learning, and (2) promote The Edge as a place for social learning and collaboration.

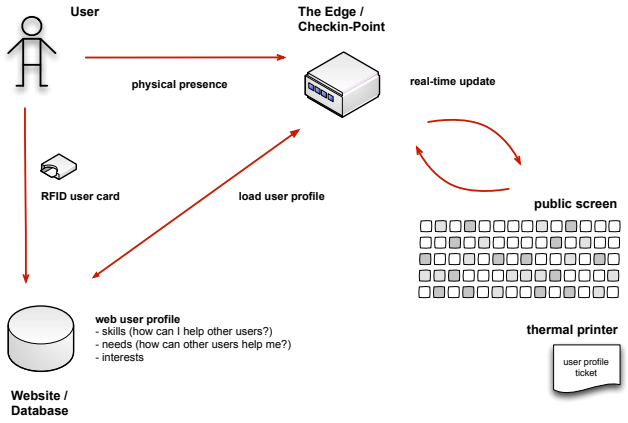

Figure 1: System overview of Gelatine – users can leave a digital footprint of their skills and needs on a public screen by swiping their RFID user card at the entrance or workspace in the library building.

Gelatine provides an online / mobile website for users to create a personal profile with keywords ('tags') that describe their skills, areas of interests, as well as areas that they have a problem in or want to learn more about. This profile information is linked to their RFID membership card, which they can swipe at one of the 'checkin-points' at the entrance of The Edge or sub locations such as individual workspaces, computer lab or coffee kiosk to confirm their presence in the space. RFID cards, as a method for a seamless user checkin process, were selected in respect of the library's institutional mission as a socially inclusive space (Leckie & Hopkins, 2002). Smart phones or other 'personal' devices could discriminate against users who do not own and cannot afford them. Each checkin point is made up of a network controlled RFID / NFC reader box, that, every time a user checks in, attaches a timestamp to the user's ID and saves it to the Gelatine system database. A custom designed visualisation on each of two public screens (Figure 2) is updated in real-time according to the profiles of those users who checked in. The two screens are designed to answer three basic questions: (1) How can other users help me? (2) How can I help other users? (3) What areas of interests can I engage in with other users?

Each of the two screens displays a tag cloud visualisation of keywords that describe the skills (areas a user can provide help with) and needs (areas a user seeks help

with) of all currently checked-in library users. Tag clouds were selected as a visualisation technique in order to facilitate browsing and serendipitous ('non-specific') information discovery (J. Sinclair & Cardew-Hall, 2008). Further, in contrast to explicit search interfaces, tag clouds are better suited for the presentation of ambient information that can be perceived in the periphery of people's attention. Figure 2 shows an installed prototype of the Gelatine screens, as well as their location in the floorplan as installed at The Edge.

Figure 2: Prototype of the 'Gelatine' checkin-system and its location at The Edge – two public screens display a tag cloud with keywords that describe domains all currently checked-in users that can provide help with or seek help in the space.

In order to avoid the 'screen blindness' phenomenon often found with people passing by public screens (Müller et al., 2009), and to represent available skills and knowledge grouped by individual users rather than in an aggregated tag-cloud form, we added an additional 'low-tech' display next to the two public screens: We installed a small, networked thermal printer (similar to the point of sale printers at the local supermarket or gas station) that prints out a user profile ticket for each user that checks in. The user can then decide to pin his ticket on a blackboard to make their skills apparent and available to other users in the space. The two screens and the ticket blackboard provided a central display of engagement opportunities with currently co-present users (Figure 2). In order to encourage face-to-face encounters, users can click / tap on the respective tag to find the user behind that tag if they are curious about a particular skill. The associated user information and location are polled from the checkin-system database in real-time and displayed in a pop-up window. To provide a sense of currency, the different tags in the clouds are colour-coded according to the respective checkin-timestamp. Tags of users that checked in most recently (past 2 hours) are displayed in bigger font-size and red colour. Keywords of check-ins further in the past are coloured in green (up to 8 hours), blue (up to 2 days) and white (longer than 2 days ago).

METHODOLOGY

In our evaluation, we were interested in what social impact Gelatine had on users, i.e. how it impacted users' perception of and relationship to the social environment at our case study site. Previous studies that discuss the social impact of public screens pre-dominantly employ long-term, longitudinal evaluations over a period of a few months or years (Churchill et al., 2004; McCarthy et al., 2008; McCarthy et al., 2009; Struppek, 2006). However, in order for a public screen to have a social impact, it needs to embody a satisfying standard of usability, as well as attract awareness to start with. Such questions require thorough, site-specific trial and error testing of different human-computer interaction specific aspects of public screens, e.g., their position and orientation (Huang, Koster, & Borchers, 2008; Schroeter et al., 2012) or means to raise by-passers' attention and motivation for use (Müller, Alt, Michelis, & Schmidt, 2010).

Conducting the evaluation from an early stage of the development came with a tradeoff: In order to identify socio-cultural barriers and challenges relevant to the system design, thus be able to inform the re-design process from an early stage, it was crucial to evaluate the system in the 'wild' (i.e. how users perceive and adopt the screen in the context of their everyday life messiness). On the other hand, a pre-mature user interface and usability issues (as usual in early prototypes) might not attract users to naturally use the system in their everyday context. We applied a mixed methodology to tackle this challenge:

As the system was yet to be approved by the State Library of Queensland for an official launch, we were only allowed to recruit a number of selected pilot study users who would create personal profiles in the system that we used as valid 'user generated' content for the evaluation of the public screens to be installed in the main visitor area at The Edge. We recruited 21 pilot study users who all form part of "Hack The Evening" – a group of technology enthusiasts who meet at The Edge every Thursday night to discuss and collaborate on projects around hacking and making things with hardware and electronics, and do-it-yourself technology. We selected "Hack The Evening" as a representative user group who uses The Edge for collaboration and social learning purposes, while remaining open to new members. The pilot study users checked in during their weekly "Hack

the Evening" meetups at The Edge, as well as their casual visits at The Edge.

The Gelatine screens and profile printouts were set up at the main foyer of The Edge (Figure 2) and evaluated in a user study for a total of six days. In the user study we not only observed the 21 pilot study users who had a user card to actually perform a check-in, but were actually even more focused on other visitors who came to The Edge and encountered the screen during their everyday visits. We did observations for a period of 3 hours every day, and varied the timeslots between afternoon, late-afternoon and evening (The Edge is closed in the mornings). We engaged 24 users in follow-up interviews (none of whom were part of the 21 pilot study users), who we selected according to different interaction patters (Michelis & Müller, 2011) with the screens. Michelis and Müller (2011) identify six different phases of user interactions with a public screen, i.e. *passing by, viewing and reacting, subtle interaction, direct interaction, multiple interactions,* and *follow-up action*. They provide empirical data showing that these phases form an 'audience funnel' – only a certain percentage of users transitions from one phase to another, and eventually, only a fraction of users ends up engaging in direct or multiple interactions with the public screen.

Our approach was to sit in a distant corner with a clear line of sight on the screens and covertly observe users ignoring, or going through and/or dropping out of these six phases in the audience funnel. We then approached the users after they finished their interaction, or passed by the screens, and asked them for a follow-up interview where we would ask them to reflect on their experience of viewing or interacting with the screen. Users who had only passed by ignoring the screen, we later 'took by hand' to the screen and asked them to 'think aloud' as they interacted with it.

In total, we interviewed 13 users who ignored and *passed by*, 7 users who *viewed and reacted*, and 4 users who *directly interacted* with the screens (clicked on the tag clouds) or printouts (came close to read or touched the printout). Interviewing users who engaged in *viewing and reacting*, we focused on how the screen affected them as an ambient information display (i.e. with the user simply perceiving the information without taking any follow-up action). With users who directly interacted with the screen, we focused on the results and motivations behind them initiating a face-to-face encounter as a *follow-up action* to their *interaction* with the screen.

Each user interview involved a 3-step process: (1) We first asked questions about the user's general visiting and use patterns as well as their perceptions of The Edge. How often do they visit? What activities do they normally engage in when they visit? What are their relationship, perception and usual interaction patterns with other users? This first phase was to help us match the interviewee to one of the five use personas that we identified in previous extensive field work at the same case study site (Bilandzic & Foth, 2013), and evaluate how Gelatine impacted different user groups. (2) We then revisited the Gelatine screens with the user, and asked them to reflect on their earlier interactions as they went through the audience funnel and 'think aloud'. The questions were open ended, and targeted at shedding light on their impressions and perceived usefulness of the system and information on the screen. (3) The third step included an open discussion about concerns and suggestions for future versions of Gelatine.

Each interview (hereinafter referred to as I1-I24) went for an average of 20-30 minutes, and every user was offered a coffee voucher as a compensation for their time. All interviews were audio-recorded and transcribed. For the data analysis we borrowed grounded theory techniques, and categorised the user comments according to emerging and reoccurring reactions to Gelatine, and how it has or has not impacted their sense of place in comparison to their previous use patterns at The Edge.

DISCUSSION OF FINDINGS

The following sections discuss our interviewees' thoughts, impressions and reasons for use or non-use of the screen throughout the different phases of the audience funnel (Michelis & Müller, 2011) (Figure 3).

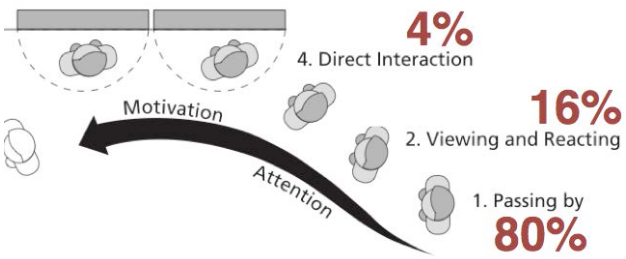

Figure 3: Observation along the 'audience funnel.' Illustration adopted from (Michelis & Müller, 2011)

Passing by

Even though the screens were placed in the middle of the foyer (i.e. everyone who entered the space had to pass them), most people who entered during our 3 hour observation slots (25 people on average) either completely ignored (80%) or only took short notice of them (16%). Only 4% actually interacted with the screen.

We followed-up with 13 users who ignored the screen and interviewed them on their pre-entry motivations, use patterns and attitudes towards the space.

12 out of those 13 interviewees reported to be regular users, who had been visiting The Edge for at least three months on a weekly or sometimes daily basis. They all come to The Edge with a particular pre-entry motivation, i.e. a purpose of completing a set of pre-defined tasks. Upon entering The Edge, these users follow established routines without paying much attention to signs, posters or installations in general. Their main focus of attention is to occupy a space and work on the tasks they came in for. For example, we encountered a backpacker (I1) who, for the past two months would come in every day to access a computer and search for jobs on the Internet; an Indian student (I10) and her tutor would use a work lounge to study English three times a week; another daily visitor

(I4) – a young man – would come in to read online news, watch YouTube videos and download online e-lectures to avoid stressing the download limit of his Internet plan at home; a self-employed programmer (I19) uses The Edge between two to five times a week to work on his free-lancing projects and avoid the distractions from home.

In contrast, the few users who actually *viewed and reacted* (16%) or *directly interacted* (4%) with the screen were mostly people who were new to The Edge. We usually observed such users wandering around the space, looking at posters, brochures and signage in an attempt to find out what this place is about. Eventually, they would stumble upon the public screens and visitor profile printouts and spend a few minutes browsing through them. Some regular users would *view and react* to the screen during short work breaks, e.g., on their way back from getting a coffee at the internal café or the toilet.

In summary, these observations show that people, who have more open and exploratory attitudes towards the space, are more likely to *naturally* push through the 'audience funnel' than others who follow established routines and tasks in the space. To those, who actually noticed and interacted with the screen, its nature as an ambient information display (i.e. information is presented in a way that is perceivable in the physical manifestation of space) turns out to be crucial for them to perceive the displayed information in the first place. Had the information been hidden behind a website, none of these users would have actively sought or become aware of it.

Viewing and Reacting

The impressions and reactions upon *viewing and reacting* to the screens were mixed, and depended highly on the individual user's pre-entry motivations and attitudes towards the space and other people in the space.

Non-use

Four interviewees, after recognising the social intentions of the system, reported that they do not have any interest in socialising or meeting other users. This matched our observations of tactical practices (cf. Lefebvre, 1991) these interviewees and many other users apply to isolate themselves from the social environment in the space; they, for example, put on headphones or close the curtains around their workspace, signaling their desire not to be disturbed or interrupted in their activity. These following statements represent typical responses we heard in the follow-up interviews:

"I am here to find a job, not interested in much else to be honest." (I1)

"I am here to prepare for my English test, why would I bother talking to anyone else?" (I10)

"I don't normally communicate with people. I don't come here for social purposes […] I don't think I would use [Gelatine]. I can see how it's a good service, and how a lot of people might benefit from it, but I am more of an individual user. I have my own interests and stuff that I look at." (I4)

For such users – with their own pre-defined work agenda that involves isolated work, and without intrinsic motivation for social learning or shared encounters with others – a system like Gelatine does not make a difference; they choose to remain non-users (Satchell & Dourish, 2009).

Amplified sense of place

For first-time visitors, who, upon entering are generally curious (and often confused) about the purpose of the space (Bilandzic & Foth, 2013), the screens and user tickets provide a lens that 'amplifies' their perception of the socio-cultural environment that is embodied, but underrepresented in the place. In contrast to many posters, brochures and signs that were put up to promote library offers, such as workshops or events, the screens provided a real-time glimpse into other users' activities and interests. By making visible these invisible socio-cultural aspects of a place, new people to the space perceive a sense of place that would be invisible or hard to grasp otherwise. The invitation of the screens to approach other users for providing or seeking help frames their notion of the purpose and function of The Edge as a place for collaboration and learning with others. As a first-time visitor couple, who stumbled upon the screen, stated in their follow-up interview: *"We were trying to figure out what this place is […] to be honest, I am still not 100% sure what it is all about. I imagine if you come here and look at these people they are busy doing whatever they are doing. This [the printouts] sort of indicates that people are here sort of wanting other interesting people to come and chat to them?"* (I16/17)

They were able to construct an idea of the purpose of The Edge as a space for collaboration and social learning, which they – prior to the installation – would struggle with if not explained by a staff member.

Further, the nature of the screen content is perceived as constructed bottom-up, i.e. socially constructed by people, rather than imposed top-down the library. For example, in contrast to a billboard at the entrance of the space, the public screen does not tell *what the space is built for* from the space designers' and planners' point of view, but rather *how it is actually being used* by other users (Figure 4).

"When you read you see someone is offering [...] you realise it's made by people; this is not like just made up by someone, you know, you kind of recognise this is sort of a social thing. Somehow you do, I don't even know how I do. You just kinda get it…" (I12).

As one interviewee pointed out, the screen provides an 'implied consent' that the users who signed up for Gelatine are happy to be approached and open to conversations: "*… I guess the fact is that there is this sort of implied consent to have that happen, because they've put their stuff up there; you know it's not just I've come here to work in the space privately and now I'm gonna have ten people who are interested into what I am interested in and come and harass me" (I9)*

This implied consent further strengthens the notion of a place where meeting and interacting with strangers is socially accepted. Some first-time visitors that we interviewed have marked The Edge as a future destination for serendipitously meeting likeminded and skillful people. *"It [looking at the screen] definitely makes me think that I should come down here to do some of my work. Just the idea of being in the same space is kind of cool […] I don't know, the potential that I could end up having a conversation instead of doing my work, that's always nice… yeah like, there's all sorts of strange people here." (I14)* They remember The Edge as a place where they are likely to meet people that have the skills and interests that are displayed on the screen.

Figure 4: Gelatine user ticket printouts vs a library billboard: While library billboards tells the space designers' perspective what the space has been built for, Gelatine displays *how* the space is actually being used by its users.

Amplified sense of coworkers

In our previous user study at The Edge (Bilandzic & Foth, 2013), we identified that one of the core motivations for regular users coming to the Edge is the ability to work in a social environment among other users, and away from the distractions of home. The exponential rise of professional for-profit coworking spaces since 2006 (Deskmag, 2011a) underlines the desire of independent workers to work amongst others, as well as most coworkers' desire for social interactions (86%), the ability to share knowledge (82%), and the serendipitous opportunities facilitated through such interactions (79%) (Deskmag, 2011).

In contrast to the isolated work attitudes of non-users' discussed above, users with coworking attitudes at The Edge are generally open and glad for serendipitous discoveries in their environment. They appreciate Gelatine as a virtual window that triggers curiosity, and provides inspiration and stimulation by other users.

"Even if I wouldn't actually go and chat to anyone there, but it still looks nice; friendly; even if you don't do anything about it, if you just read it then I think it's good for you. It gives you an idea about what are the people using this space for. I think that's interesting" (I15). Whilst our interviewees reported that they were obviously aware of their coworkers' presence, the profile information on the screens and printouts revealed new facts about their skills and backgrounds. One regular coworker that has been coming to The Edge almost every day for over a year, was surprised by the amount and diversity of skills he found in the tag cloud. After having scanned different keywords in the tag cloud, he stated: *"I am actually learning new things about this place that I didn't know. I thought there was much less than what's there [on the screen]. To be honest, I really only thought it was design, video and music. I didn't think there was anything more than that […] I thought everybody who is in here is very like... sort of arty; it's interesting to see that there is a lot to offer here." (I3).* For another interviewee, who generally tends to work alone, the screen raised some awareness and thoughts of other coworkers that he did not have before. *"I guess I hadn't thought about why other people come here. I am usually in my own headspace when I come here. So it's interesting to see that so many people use it for such a diverse range of uses." (I7).* This increased awareness of interests and skills of strangers in the same space, affords serendipitous encounters and inspiration. Another interviewee, for example, who saw *'scuba-diving'* in the tag cloud reported that *"[scuba-diving] is something that's not even actually offered here [by the library], but you end up doing it because you were here […]"* He felt that, by incidentally sharing the same space with other users at the same time, he has got access to their interests and areas of expertise – *"…now you can really say you are at the right place at the right time. I mean if you are here, and this person is here as well or you have got their email."(I3).*

Direct Interaction and Follow-up Action

The goal in this phase was to evaluate the system against the opportunity it provided to identify the location of and ice-break face-to-face conversations with like-minded users or users with complementary skills. We regarded the *follow-up action* as a user initiating (or not initiating) a face-to-face conversation as a result of their screen interaction. Only 6 users of all people we observed during our observation timeslots (4%) made it naturally to the direct interaction phase. Out of those we experienced two successful face-to-face encounters as well as two unsuccessful attempts to initiate an encounter. We asked those users to reflect upon their experience, as well as gathering additional thoughts and feelings from other users who we manually guided through the direct interaction phase.

One successful face-to-face encounter was initiated by I12 – a university student of IT and digital media, and regular user at The Edge for three years. He reported a frequent issue he faces when working on his university assignments: *"…sometimes I am stuck, so I have to go and search, and search, and search, and try find specific things. If you're learning a new program, you need to go on the Internet, but I wish someone just tells you what to do" (I22).* During our pilot study, he stumbled upon a profile printout from a user at the "Hack The Evening" group who had specified skills in 3ds-Max – a software tool for 3D modeling that I22 needed for a university assignment. That day, he deliberately stayed at The Edge for longer than usual in order to join "Hack The Evening" for their meetup at 5.30pm. Meeting his target user later on, they spent the following 2 hours discussing different techniques and alternative developer tools for 3D

modeling. I22 was also given a list of web links, e-books and other free sources to learn about 3D Modeling. He decided to come back for the next "Hack The Evening" meetup, as reportedly, he has learned more, and in an easier way than he would have by himself. This example shows a successful face-to-face encounter that was mediated by Gelatine, and more so, resulted in a social learning experience.

Users take Gelatine as an *'implied consent'* and invitation to initiate new face-to-face encounters. I14, for example, approached an electronics hobbyist who was offering his expertise on 'Arduino' (a microcontroller platform), and had a chat to him about how he could apply Arduino for his hobby in creating new interfaces for electronic music instruments. Reflecting upon his follow up action, he stated: "*…so what's the worst, like, they just think I am idiot and I just have to leave. I could probably deal with that, I just never come back again (laughing). I think it was doable." (I14).* For a user to initiate a conversation, a personal benefit has to arise from that conversation. "*If it was particular to my exact interest, than yeah. I would go 'oh wow'; I would go and have a chat with them." (I9).* Initiating conversations just for the sake of socialising and personal chit chats without any deeper purpose does generally not appeal. "*So if there is an actual thing where there's gonna be some sort of transaction then yes, but just for general chit chat probably not..."(I9)* Similarly, another interviewee stated his strict interest in professional skills, rather than personal details about other users *"…I am more interested in his professional skills, not the colour of his hair. Like, if I want to get something done. Tell me what he is good in" (I19).* The decision to approach another user also appears to depend on someone's general personality and openness towards other people. In contrast to I14 and I22's example above, I15 and I7, both regular coworkers at The Edge, were a bit more hesitant when we asked them to 'think aloud' while they reviewed where particular users were located. *"…I don't know if I'd feel comfortable just going to a booth and… well, maybe… to be honest, I didn't feel very hard about it and probably I was just on my way to grab the coffee. I don't know, I think it's nice. It looks friendly."* (I15). This example illustrates the significance of the situated context and a user's urge to gather a particular skill for them to initiate a face-to-face conversation.

Another strong motivation for use emerged by regular users who were keen to identify like-minded others in order to grow their community of interest. I3, even though he has been a daily visitor at The Edge for almost one year, works on music projects but finds it hard to identify like-minded musicians and music producers at The Edge. He does not feel well connected; *"…like there is not anything much that makes musicians here interact, to be honest. I heard of so many that use this space, but, I have only met two. But I am pretty sure that there is so many more than them. Because some people actually go in the recording studio and leave, they don't stick around in the public areas..."* He perceives Gelatine as a welcomed tool that will help him find other musicians. *"It will be so much easier you come and see 'oh that person is actually somewhere in here.' I will definitely be a user of this, I am signing up. To meet other musicians and music producers […] Honestly, I was trying to find a way how to put it, but I mean this is what's missing. It's very vital for people to interact..." (I3).*

Limitations, Challenges and Future Work

Through the evaluation, a few challenges emerged to be considered by future versions of Gelatine or similar systems. Non tech-savvy interviewees had problems understanding the mental model behind the RFID check-in concept and the tag-cloud reflecting the profiles of all currently present people in real-time. McCarthy et al. (2009) report similar challenges in their study with users at third places, and suggest 'information flyers' as a fruitful solution. One user that interacted with the screen found a skill-tag ("C++" – a programming language) that he was interested in, and which pointed to a person at workspace 8. Wanting to initiate a conversation, he walked over to workspace 8, but found the person occupying the space was a homeless person (*"kind of old," "…had a lot of plastic bags").* He assumed that that person could not possibly be the person on the screen with the C++ skills. A profile image behind each tag might help match people in the space with their digital representations on the screen.

Another participant raised the issue that the turnaround time to find a facilitator for the (computer programming related) types of problems he usually faces might be too slow. *"…if you've a problem right now, I don't think that system will be fast enough to help you"* (I19). On the other hand, users reported that they are usually too busy working on their own things to actively go and browse through the tag cloud in order to provide help for someone else. *"…it's not a problem of me willing to help, it's kinda willing to help without spending a lot of time on just kinda reading or searching for whom to help […] that'll be a waste of my time" (I19).* Future versions will integrate web and mobile application modules that 'helpers' can configure to be notified if someone in the space requests help with an issue in their particular areas of expertise.

A longitudinal study would need to shed light on how Gelatine would actually transform a space like The Edge in long-term. Placemaking requires providing users with a sense of ownership, and encouraging them to continuously shape and re-appropriate spatial infrastructure according to their needs and comfort. In contrast to the physical space in most libraries, Gelatine's infrastructure has been designed to embrace the user community to become co-designers and co-developers of the system. It is based on open-source software and hardware, the development code is made openly accessible on Github, and we provide an API to the Gelatine database for users to create their own visualisations of checkin-data and user profile information (find detailed more detailed information at http://tinyurl.com/gelatine2013). Whilst the tag cloud visualisation showed its potential for serendipitous skill discoveries among users, it also triggered some alternative visualisation ideas among the interviewees,

such categorisation of checked-in users according to their background (designers, artists, coders, etc.) or check-in timestamp (timeline). Further research needs to investigate the alternative visualisations through dedicated participatory design sessions and their respective impact on users' sense of place and ownership.

Further research also needs to investigate opportunities of other smart space applications and concepts that are enabled through the Gelatine infrastructure. Gamification elements, as we discuss elsewhere (Bilandzic & Johnson, 2013, forthcoming), could enable users to collect reward points or unlock "badges" through providing assistance to other users, which then can be exchanged for premium library services (multimedia equipment hire, extension of book loans, etc). The evaluation also highlighted the contradictory perceptions of "non-users" and "users with coworking attitudes" which raise cultural and political questions for the space managers, such as the installation of "quiet" and "social" spaces.

CONCLUSION

Designers and placemakers cannot create a 'sense of place' on their own. Place is created by people, their intrinsic motivations for particular activities, and patterns of use. This study shows that public screens such as Gelatine, by making invisible socio-cultural aspects of a place visible, have the potential to 'amplify' users' perceived sense of place as well as sense of situated people at a place. In contrast to personal displays (e.g., smartphones), Gelatine embodies digital footprints of situated users as part of the public space; hence serendipitously perceivable to all passers-by, most of whom would not actively retrieve or stumble upon such information otherwise. Further, the study shows that whether a user takes notice, ignores or interacts with the screen highly depends on that user's individual pre-entry motivations and attitudes towards the surrounding place and people at the place. In summary, Gelatine was used to fulfil needs that users have had before Gelatine was introduced (c.f. Bilandzic & Foth, 2013), e.g., for divergent (exploratory, opportunistic, serendipitous) and convergent (goal-directed, focused, explicit search) information behaviour (Björneborn, 2010). F*irst-time users'* browsed the screens to get a better sense of purpose and function of the space, and *coworkers* identified likeminded or more knowledgeable users. On the other hand, users who were not interested in engaging with their fellow coworkers prior to the installation of Gelatine, showed no interest in using Gelatine either. This underlines the design of public screens not only being a matter of (human-computer) interaction design, but even more so a matter of a broader placemaking (Schneekloth & Shibley, 1995) strategy at the place of installation. The purpose and function of a public screen need to match with the prospective user's role and motivation of being at that place. Given such a match, public screens such as Gelatine can serve as a powerful *hybrid* tool for placemaking. Follow-up thoughts on *hybrid placemaking* are elaborated in (Bilandzic & Johnson, 2013, forthcoming).

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